

BULLETIN
UNIVERSITY OF WASHINGTON
ENGINEERING EXPERIMENT STATION

ENGINEERING EXPERIMENT STATION SERIES

BULLETIN No. 6

2520-410

ORNAMENTAL CONCRETE
LAMP POSTS

BY
CARL EDWARD MAGNUSSON
Professor of Electrical Engineering



SEATTLE, WASHINGTON
PUBLISHED QUARTERLY BY THE UNIVERSITY
JULY, 1919

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CARL EDWARD MAGNUSSON¹⁾
PROFESSOR OF ELECTRICAL ENGINEERING



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FIG. 1. WEST ENTRANCE, HOME ECONOMICS HALL
UNIVERSITY OF WASHINGTON

ORNAMENTAL CONCRETE LAMP POSTS

By C. EDWARD MAGNUSSON

Concrete lamp posts of the design shown in the accompanying photographs have given satisfactory service during the past eight years on the campus of the University of Washington.* Seventy poles were constructed and installed in 1911, and a second set of ninety poles of the same design were manufactured and placed in service in 1914.

The ornamental character of the poles need not be discussed, as the accompanying photographs of poles in position give ample evidence. Modifications in the color selected for the base panels and of the iron cap supporting the glass globe might be desirable.

While the structural material is chiefly concrete, the nature of the design requires the use of iron for certain parts. Thus a central iron pipe forms the core of the pole; an iron plate is used as a door on one side of the base; on top is an iron shade holder, which supports the glass globe; two iron plates in the base give the required strength to the pedestal, and four iron bolts are embedded in the concrete sub-base in order to firmly hold the post in position.

*The poles were designed and constructed by the late Mr. Frank E. Johnson, instructor in Electrical Engineering, who had charge of the campus lighting in 1905-15.



FIG. II. LOOKING NORTH FROM BAGLEY HALL
UNIVERSITY OF WASHINGTON

Gravel.—In preparing the concrete, considerable care was taken in the selection of the gravel aggregate. A preliminary series of experiments was made to determine what size of gravel would produce the best results. Six sample blocks are shown in Figure III, for which the gravel was in each case passed through a narrow range of screen mesh.

In the poles on the campus such sized gravel aggregate was used as will pass through a screen of three mesh to the inch and remain on a screen of six mesh to the inch. Selected roofing gravel was purchased and passed over two shaking screens bolted together and operated by a 5 h. p. motor. The top screen carried the coarse gravel to one side, the lower screen delivered the desired aggregate, and the sand and fine gravel were collected in a box underneath the two screens. No sand was used in the concrete mixture, as this has a tendency to give the surface a rough and dingy appearance. In Fig. IV is shown the surface of the finished concrete pole on a reduced scale.

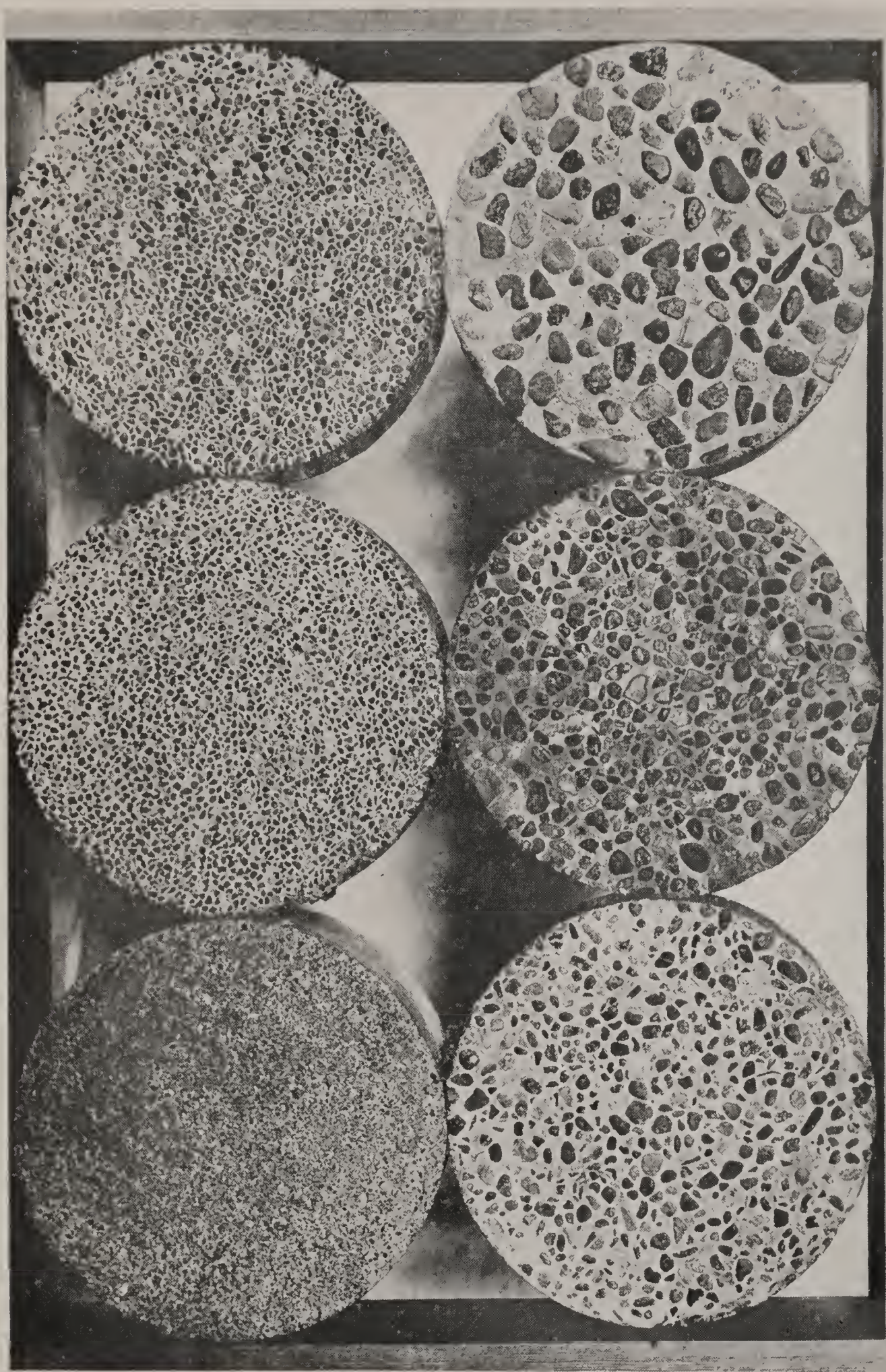


FIG. III. TEST BLOCKS, EACH EIGHT INCHES IN DIAMETER

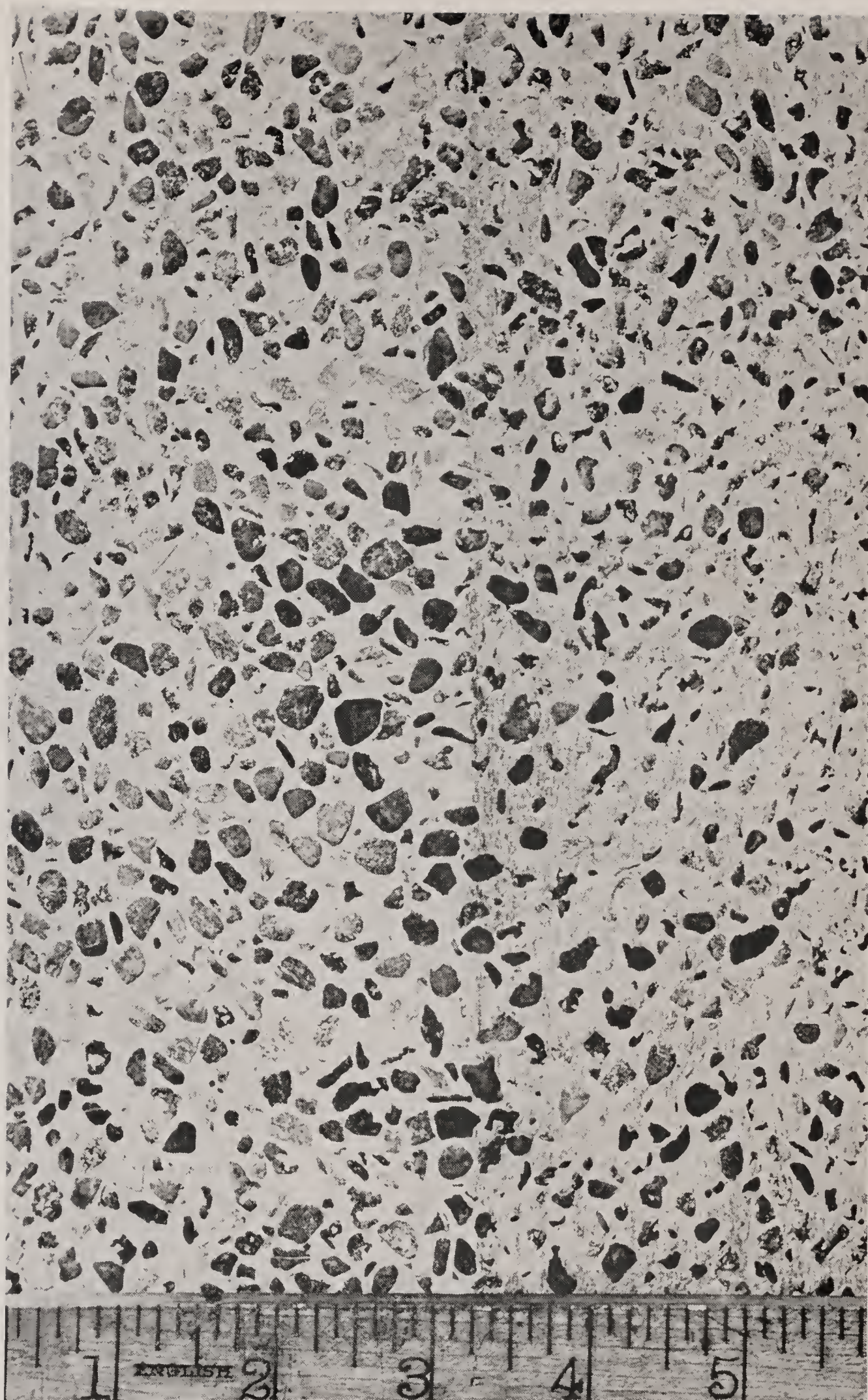
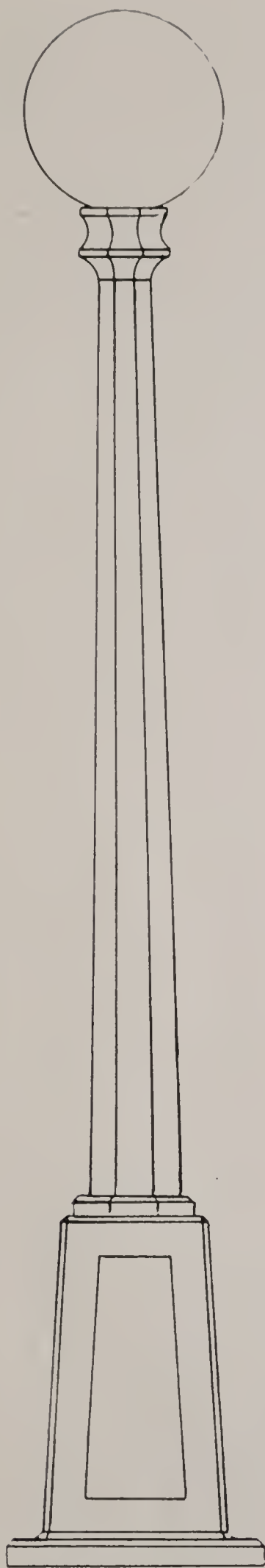
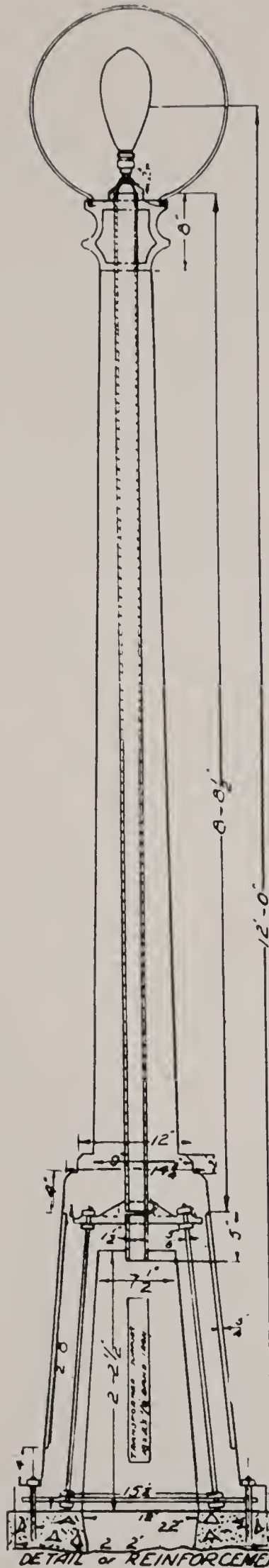


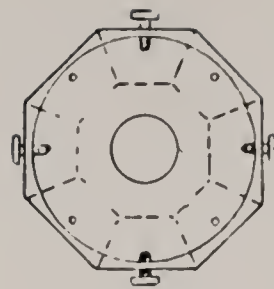
FIG. IV. FINISHED SURFACE OF CONCRETE POLE
SCALE IN INCHES



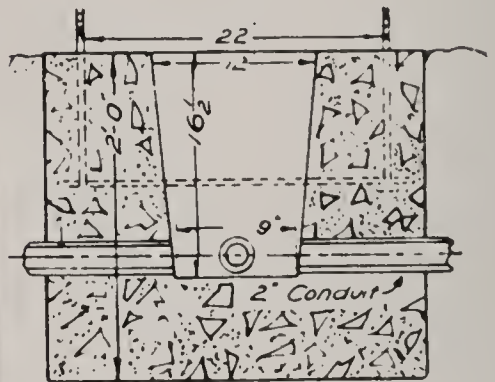
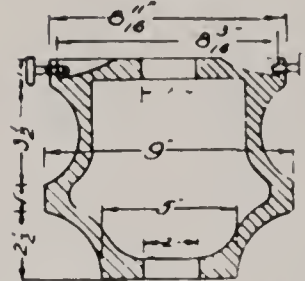
CONCRETE LAMP POST



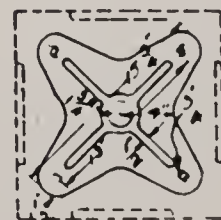
DETAIL OF REINFORCEMENT



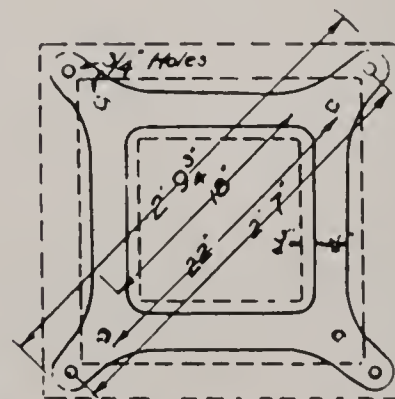
DETAIL OF SHADE HOLDER



CONCRETE SUB-BASE FOR POLE



TOP



C 1 REINFORCING PLATE BOTTOM

FIG. V. DIMENSIONS AND DETAILS

Concrete.—Two parts of cement to five parts of gravel were used in the preparation of the concrete. Several sample blocks of this mixture, eight inches in diameter and twelve inches long, were prepared and tested for compressive strength, and found to sustain from 3,000 to 4,350 pounds per square inch.

Design.—Complete dimensional data with details of the design are shown in Fig. V.

Molding.—A photograph of the mold used is shown in Fig. VI, with the iron pipe core in position. Great care must be exercised in pouring the concrete to keep the mixture uniform in all parts of the mold so as to avoid streaks and bands in the finished product. The length of time which the cement requires to set before the molds are removed depends on the dryness of the weather, the temperature, the consistency of the mixture, and to some extent the grade of cement used.



FIGURE VI. MOLD FOR CONCRETE POLES

In warm weather, molds filled in the afternoon could be removed early the following morning, while if the weather was cool and cloudy, better results were obtained by letting the molds stand for another half a day or more. No special harm is done by leaving the molds on longer than the most desirable period, except that it requires much more labor to secure the desired brush finish on the surface. If the molds are removed before the cement has had time to acquire a sufficient set, corners and other parts of the pole are apt to come off with the molds and disfigure the cast or require much patching to make it usable. The poles were made in the open air, but no doubt more uniform results could be obtained if the newly uncovered casts were under shelter and had protection from the direct rays of the sun.

Finishing.—The question of finishing concrete surfaces for artistic effects has been a subject of extended experiments, by different Portland cement associations. With a view of eliminating the objections to the lifeless, gray color of natural concrete, a series of experiments were made by introducing coloring matter while the mortar was being mixed, but the results were not encouraging. By using a dark-colored gravel, a pleasing contrast to the natural grayish background of the cement is obtained.



FIG. VII. FIRE ALARM AND POLICE STATION BOXES ATTACHED TO
CONCRETE POLE

The satisfactory appearance of the concrete surface depends chiefly upon its finish, rather than upon any given color or texture. The best finish was secured by removing the molds while the concrete was still quite green, and then carefully brushing the surface with steel brushes. After the surface has been carefully brushed and allowed to stand a few days, the monotonous, dull gray color effect may be readily removed by washing with a dilute acid, followed by a liberal rinsing with water through a hose. The rinsing must be thoroughly done before the acid has time to dry, or the surface will have a mottled, streaky appearance, little better in appearance than the original surface before applying the acid treatment. The strength of the acid solution did not seem to be important, but one part of commercial hydrochloric acid to two or three parts of water gave good results.

Handling.—One important advantage of concrete poles is the possibility of manufacturing the finished article near its final location. To distribute the poles over the campus a suitable frame was placed on a low wheeled cart. The method employed for handling the poles is readily seen from Figures VIII and IX.



FIG. VIII. RIG FOR MOVING POLES



FIG. IX. PLACING POLE IN POSITION



FIG. X
SMALL TRANSFORMER IN BASE OF POLE

Globes.—For the poles made in 1911, clear glass globes 20 inches in diameter were used. It was later determined that 18 inch globes of “Nuglass” gave satisfactory results. With translucent glass, the globe becomes a secondary source of illumination. This improves the appearance of the light standard and protects the eye against the intense brightness of the tungsten filament.

Electrical Data.—Electric power for campus lighting is obtained from 60-cycle alternators in the University power house and distributed at 2,300 volts. The current is conducted through lead-covered cables in underground fiber ducts to six distributing concrete-lined manholes. 6 by 8 feet square, and 8 to 12 feet deep, depending on the contour of the ground. At these distributing points the voltage is transformed from 2,300 volts to 240, by means of subway type transformers with $2\frac{1}{2}\%$, 5% , $7\frac{1}{2}\%$, and 10% taps to take care of varying degree drop in the feeders. From twenty to thirty poles are connected to each distributing manhole. No. 8 Duplex, 600-volt, lead-covered cable is used for the 240-volt secondary distribution. The cable is in a two-inch fiber conduit with $\frac{3}{8}$ -inch walls. In the base of each pole is a transformer (Fig. X), by which the voltage is reduced from 240 volts to 18.2 or 36.4 volts, depending upon whether a hundred candlepower or a two hundred candlepower lamp is used.

The above solution of the problem was probably the best that could be made with the type of lamps available at the time the poles were installed. Under present conditions, economy would be effected by using series lamps with compensating reactances on the 240-volt secondary distribution.



FIG. XI. FROM THE STEPS OF DENNY HALL
UNIVERSITY OF WASHINGTON

Cost.—The cost of labor and material for a concrete pole at the point of manufacture, excluding the globe, transformer, lamp and overhead charges, was, both in 1911 and 1914, \$14.50. The cost of iron poles of a somewhat similar plain pattern used by the City of Seattle was about \$36.00, without any trimmings, or about $2\frac{1}{2}$ times the cost of the concrete poles on the University campus. Disregarding overhead charges, the cost for the pole in place ready to give service and including the lamp, globe and special transformer, was, for 1911, \$38.50, and in 1914 \$36.70. This does not include the underground cable and conduit distributing system from the power house to the lamps.

Maintenance.—The maintenance expense, as well as the first cost of the concrete poles, is low in comparison to iron posts. The surface of the concrete on the campus poles shows practically no deterioration after eight years of service. The concrete surface does not scale, crack, or corrode. Two years ago a few of the poles were washed with soap and water to remove soot and dirt. The exposed iron on the plate forming the moveable panel in the base, and the iron shade holder have required much more attention than the concrete. The usual difficulties have been experienced in finding a paint that would effectively prevent the rusting of the iron.

ENGINEERING EXPERIMENT STATION

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The Engineering Experiment Station was formally organized in December, 1917, in order to coordinate the engineering investigations in progress and to facilitate the development of industrial research in the University.

A large number of investigations in the industrial field have been in progress for many years in the University, either by the efforts of individual faculty members and students or through organized groups, such as the Timber Testing Laboratory, the Bureau of Testing, Radio Experiment Station, and especially the Bureau of Industrial Research. As an indication of the research already accomplished, reference is made to the important papers already published.

The Engineering Experiment Station includes all the bureaus and departmental groups previously active in engineering and industrial research, as well as the field occupied by individual investigators.

The scope of the work is twofold:

(a) To investigate and to publish information concerning engineering problems of a more or less general nature that would be helpful in municipal, rural and industrial affairs;

(b) To undertake extended research and to publish reports on engineering and scientific problems.

The purpose of the station is to aid in the industrial development of the state and nation by scientific research and by furnishing information for the solution of engineering problems. Every effort will

be made to cooperate effectively with professional engineers and the industrial organizations in the state. Investigations of primary interest to the individual or corporation proposing them, as well as those of general interest, will be undertaken through the establishment of fellowships.

The control of the Engineering Experiment Station is vested in an administrative staff consisting of the president of the University, the dean of the College of Engineering, as ex-officio director, and seven members of the faculty. For administrative purposes, the work of the station is organized into seven divisions:

1. FOREST PRODUCTS.

This division covers the field of the College of Forestry, and includes wood distillation, wood preservation and cooperative work with the Seattle Station of the United States Timber Testing Laboratory.

2. MINING AND METALLURGY.

This division represents the field of the College of Mines, and includes cooperative work with the Seattle Mining Experiment Station of the United States Bureau of Mines.

3. CHEMICAL ENGINEERING AND INDUSTRIAL CHEMISTRY.

This division represents the application of chemistry to engineering and industrial problems.

4. CIVIL ENGINEERING.

This division covers the field of the Department of Civil Engineering, with emphasis on hydraulic and sanitary engineering and the testing of road and structural materials.

5. ELECTRICAL ENGINEERING.

This division includes the several branches of electrical engineering: electric railways, telephones, telegraphs, radio, illumination, and electric power.

7. PHYSICS STANDARDS AND TESTS.

This division is equipped with reliable physical standards, and the work is largely calibrating and testing of instruments and other physical apparatus.

6. MECHANICAL ENGINEERING. This division includes mechanical engineering, marine engineering, and aeronautics.

Inquiries in regard to the work of the Engineering Experiment Station should be addressed to the Director.

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1. Forest Products
2. Mining and Metallurgy
3. Chemical Engineering and Industrial Chemistry
4. Civil Engineering
5. Electrical Engineering
6. Mechanical Engineering
7. Physics Standards and Tests

The results of the investigations are published in the form of bulletins. Requests for copies of the bulletins and inquiries for information on engineering and industrial problems should be addressed to the Engineering Experiment Station, University of Washington, Seattle.

